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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/044,413	10/24/2001	Tim Coe	40705/DMC/V165	9554

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EXAMINER

BAKER, STEPHEN M

ART UNIT PAPER NUMBER

2133

DATE MAILED: 08/26/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/044,413

Applicant(s)

COE, TIM

Examiner

Stephen M. Baker

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Low-Density Parity Check Forward Error Correction".

2. The disclosure is objected to because of the following informalities:

On page 1, in line 10, "inherit" apparently should be "inherent".

On page 4, in line 18, "priority" apparently should be "parity".

On page 4, in line 22, "c_{be}" apparently should be "c_{xb}".

On page 4, in line 30, "comprises of" apparently should be "comprised of".

On page 5, in line 5, "priority" apparently should be "parity".

On page 6, in lines 4 and 5, "fiberoptic" apparently should be "optical fiber".

On page 7, in line 15, "word have" apparently should be "word has".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 2: in line 3, "further second number of code symbols" apparently should be "further number of code symbols", to avoid confusion with the "further second number of code symbols" recited in lines 4-5; in line 4, "forming further" apparently should be "forming a further".

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-6 and 9-15 are rejected under 35 U.S.C. 102(b) as being anticipated by the published article "Time-Varying Periodic Convolutional Codes With Low-Density Parity-Check Matrix", by Felstrom et al (hereafter "Felstrom").

Felstrom discloses a convolutional LDPC code, encoder and decoder, the encoder (Fig. 4) being for "forming sets of code symbols out of a series of sets of code symbols for use in a systematic iteratively decoded code". Every other bit output from Felstrom's encoder is the data bit input to the encoder at the same time, each "code symbol" v that is output being either a systematic (i.e. input data) bit $u = v_1$ or a non-systematic (i.e. parity) bit v_2 . The systematic bits passed through Felstrom's encoder

are a "first set of code symbols" formed from a "first set of data symbols" as they are identical to the "first set of data symbols". The parity bits output from Felstrom's encoder are "a second number of code symbols" formed using the "first set of data symbols and previously formed code symbols". As Felstrom's encoder shift-register is filled by the last $M+1$ alternating data bits and parity bits that were output, the parity bits are formed using "code symbols (that are formed) using a previously formed set of code symbols".

Regarding claims 2-4, systematic bits in the latter half of a block of encoded data from Felstrom's encoder are a "further ... number of code symbols (formed) from a second set of data symbols", and the parity bits interleaved therewith are a "further second number of code symbols (formed) using the second set of data symbols and previously formed code symbols". As Felstrom's encoder shift-register is filled by the last $M+1$ alternating data bits and parity bits that were output in the latter half of a block of encoded data, the parity bits are formed using "code symbols (that are formed) using a previously formed set of code symbols".

Regarding claims 5, 6 and 11, Regarding claims 5, 6 and 9-15, Felstrom's parity bits are formed using an "XOR operation" in a feedback path, and Felstrom's decoder (Fig. 5) is for "iteratively decoding the code symbols". Felstrom shows (Fig. 3e) a "linked low density parity check matrix" of the LDPC code formed by Felstrom's encoder, which is formed by "extending a portion of an original LDPC matrix" as also shown (Figs. 3a - 3c). The "portion" is shown shaded (Fig. 3a) and includes a "base portion" (two "1" elements), an "upper extending portion" (two "0" elements above the

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"base portion") and a "sideways extending portion" (two "0" elements beside the "base portion").

7. Claims 1-8 and 10-12 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,023,783 to Divsalar *et al* (hereafter Divsalar).

Divsalar discloses a recursive convolutional code decoder (Fig. 4) with two parallel inputs (u_1, u_2). It is here noted that the arrow next to the indicia h_{03} should be redrawn as leaving the rightmost XOR gate, rather than entering it. As the parity check matrix of an encoded block from such an encoder has more zeroes than ones in it, the code is a "low density parity check matrix" code. Parity bits x_0 initially generated by the encoder are formed responsive to systematic bits $u_1 = x_1, u_2 = x_2$ only. Later-generated parity bits are formed responsive to the encoder's recursive feedback connections h_{00}, h_{01}, h_{02} .

Regarding claim 7, the input bits to Divsalar's encoder (in successive encoder bit times t_1, t_2 , etc.) can be denoted as data bits $d_1 = u_1(t_1), d_{1a} = u_2(t_1), d_2 = u_1(t_2), d_{2a} = u_2(t_2), \dots$ etc. The output bits from Divsalar's encoder can be denoted as code bits $c_1 = u_1(t_1) = x_1(t_1), c_{1a} = u_2(t_1) = x_2(t_1), c_{1b} = x_0(t_1), c_2 = u_1(t_2) = x_1(t_2), c_{2a} = u_2(t_2) = x_2(t_2), c_{2b} = x_0(t_2), \dots$ etc.

Regarding claim 8, $d_1 = u_1(t_1) = x_1(t_1), d_{1a} = u_2(t_1) = x_2(t_1)$ are a "first set of data symbols", $c_1 = u_1(t_1) = x_1(t_1), c_{1a} = u_2(t_1) = x_2(t_1), c_{1b} = x_0(t_1)$ are a "first set of code symbols", $d_2 = u_1(t_2) = x_1(t_2), d_{2a} = u_2(t_2) = x_2(t_2)$ are a "second set of data symbols", and $c_2 = u_1(t_2) = x_1(t_2), c_{2a} = u_2(t_2) = x_2(t_2), c_{2b} = x_0(t_2)$ are a "second set of code symbols". The encoder output at time t_2 includes parity $x_0(t_2)$ that is a "selective XOR combination"

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of the "first set of code symbols", which are stored in combination in the rightmost shift register stage D and input to the XOR gate adjacent the output x_0 , and of "the second set of data symbols", which are also input to the same XOR gate. Correspondingly, at time t_3 , the situation repeats analogously for a "third set of data symbols" forming a "third set of code symbols".

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.


9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. Baker whose telephone number is (703) 305-9681. The examiner can normally be reached on Monday-Friday (11:00 AM - 7:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert DeCady can be reached on (703) 305-9595. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Stephen M. Baker
Primary Examiner
Art Unit 2133

smb